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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

PICKARD, ALISON K

ART UNIT	PAPER NUMBER
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3676

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/903,313

Examiner

Alison K. Pickard

Applicant(s)

ZHENG, XIAOQING

Art Unit

3676

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6,7,11-30,32,33,37-57,60,61 and 64-78 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,7,11-26,28-30,32,33,37-52,55-57,60-76 and 78 is/are rejected.
- 7) ☒ Claim(s) 27,53 and 77 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

1. Claims 50 and 51 are objected to because of the following informalities: claims 50 and 51 depend from cancelled claim 31. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 3, 4, 6, 7, 11-16, 19, 20, 22, 23, 30, 32, 33, 37, 38, 41-43, 45, 46, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over DE '566 in view of Henderson (3,727,924).

DE '566 discloses a rotary seal assembly comprising a stator 3 having a seal face and a rotor 2 having a sealing face. As seen in Figure 1, the stator 3 has a feeding groove 20 having a plurality of orifices 21 therein supplies the fluid to the center portion. The orifices are angled. Further, either (see abstract, and therefore the rotor 2) the first or second member has plural pumping grooves wherein a first set 19 starts proximate a center portion of the sealing face and extends outward while a second set 18 starts proximate the center and extends inward. The first set terminates inward of an outer portion of the sealing face. The second set terminates inward an inner portion of the sealing face. The first and second sets start adjacent each other at the center portion and curve outward and inward, respectively. Each groove has an inside edge and an outside edge curving inwardly. The pumping grooves direct fluid fed to the center

simultaneously both inward and outward to provide a uniform fluid film thickness between the sealing faces during coning. DE '566 does not disclose that the feeding groove 20 is discontinuous forming a number of feeding groove sections. Henderson teaches rotary seal assembly comprising a rotor and stator each having a sealing face, wherein a feeding groove supplies fluid to the center of the faces and is then directed both inward and outward to provide a uniform fluid film (see col. 3, lines 34-44). Henderson teaches that the feeding groove 28 can be a continuous annular groove or a plurality of arcuate grooves (i.e. discontinuous). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to make the feeding groove of DE '566 discontinuous as such is an art equivalent as taught by Henderson.

4. Claims 1, 3, 4, 6, 11-25, 30, 32, and 37-51 rejected under 35 U.S.C. 103(a) as being unpatentable over Lebeck in view of Henderson.

Lebeck discloses a rotary seal assembly comprising a first member having a sealing face and a second member having a sealing face. The first member can be one of a rotor 40 or stator 42. The second member can be the other of a rotor or stator. The first or second member has plural pumping grooves wherein a first set 96/100 starts proximate a center portion of the sealing face and extends outward while a second set 94/98 starts proximate the center and extends inward. The first set terminates inward of an outer portion 144 of the sealing face. The second set terminates inward an inner portion 154 of the sealing face. The first and second sets start adjacent one another (Fig. 5) or offset from one another (Fig. 6). The first and second sets start adjacent each other at the center portion and curve outward and inward, respectively. Each groove has an inside edge and an outside edge curving inwardly. The pumping grooves direct

fluid fed to the center simultaneously both inward and outward to provide a uniform fluid film thickness between the sealing faces during coning. A feeding groove 68 having a plurality of orifices 84 therein supplies the fluid to the center portion. Lebeck does not disclose that the feeding groove 68 is discontinuous forming a number of feeding groove sections. Henderson teaches rotary-seal-assembly comprising a rotor and stator each having a sealing face, wherein a feeding groove supplies fluid to the center of the faces and is then directed both inward and outward to provide a uniform fluid film (see col. 3, lines 34-44). Henderson teaches that the feeding groove 28 can be a continuous annular groove or a plurality of arcuate grooves (i.e. discontinuous). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to make the feeding groove of Lebeck discontinuous as such is an art equivalent as taught by Henderson.

Regarding claim 47, Lebeck does not disclose the pumping grooves have a width exceeding their depth. This is considered a design choice. Applicant has not stated that forming the grooves so that their width exceeds their depth solves any stated problem or is for any stated purpose. And, it appears the pumping grooves of Lebeck would perform equally as well. Regarding claims 50, and 51, Lebeck does not disclose that feeding groove has a rounded or square bottom. This is considered a design choice. Applicant has not stated that forming the feeding groove with a rounded or square bottom solves any stated problem or is for any stated purpose. And, it appears the feeding groove of Lebeck would perform equally as well. Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the pumping grooves so that their width exceeds their depth and the feeding groove with a rounded or square bottom as a matter of choice in design.

5. Claims 26, 28, 29, 52, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lebeck in view of Henderson as applied to claims 1 and 30 above, and further in view of Lindeboom.

Lebeck discloses a rotary face seal assembly wherein one member 42 has a holder 58 and spring 56. However, the spring does not bias the first and second members apart. Lindeboom teaches a rotary face seal assembly wherein one member 30 has a holder 48 and a spring 52 that biases the first and second members apart. This arrangement provides a normally open, rather than closed, seal assembly. Keeping the assembly open would reduce wear during start up. Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made modify the holder, member, and spring of Lebeck such that the spring biases the first and second members apart as taught by Lindeboom to reduce wear on the members during start-up.

6. Claims 30, 55-57, 60, 61, and 64-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson in view of Lebeck in view of Henderson.

Peterson discloses a rotary face seal assembly comprising a stator 3 having a sealing face and a rotor 2 having a sealing face. The stator is mounted on a holder 8 that allows the stator to cone negatively or positively with respect to the rotor. The stator or rotor can have pumping grooves 21 in the sealing face. Peterson does not disclose that the grooves are partitioned into first and second sections or that the rotor or stator has a feeding groove and orifice. Lebeck teaches a rotary face seal assembly wherein the sealing faces of the rotor or stator comprise plural pumping grooves having a first section and second section and a feeding groove having plural feeding orifices. The second section of pumping grooves 96/100 starts proximate a center

portion of the sealing face and extends outward while the first section 94/98 starts proximate the center and extends inward. The first set terminates inward of an outer portion 144 of the sealing face. The second set terminates inward an inner portion 154 of the sealing face. The first and second sets start adjacent one another (Fig. 5) or offset from one another (Fig. 6). The first and second sets start adjacent each other at the center portion and curve outward and inward, respectively. Each groove has an inside edge and an outside edge curving inwardly. The pumping grooves direct fluid fed to the center simultaneously both inward and outward to provide a uniform fluid film thickness between the sealing faces during coning. The feeding groove 68 having a plurality of orifices 84 therein supplies the fluid to the center portion. Lebeck teaches that this configuration creates two different gas seals and causes the gas pressure to distribute itself across the seal faces so that a desired stiffness is achieved. This also allows ensures a seal across the faces whenever there is deflection in one of the faces. Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the sealing faces of Peterson with the groove configurations as taught by Lebeck to ensure an effective seal and the proper film stiffness during sealing face deflection.

Lebeck does not disclose that the feeding groove 68 is discontinuous forming a number of feeding groove sections. Henderson teaches rotary seal assembly comprising a rotor and stator each having a sealing face, wherein a feeding groove supplies fluid to the center of the faces and is then directed both inward and outward to provide a uniform fluid film (see col. 3, lines 34-44). Henderson teaches that the feeding groove 28 can be a continuous annular groove or a plurality of arcuate grooves (i.e. discontinuous). Therefore, it would have been obvious for

one of ordinary skill in the art at the time the invention was made to make the feeding groove of Lebeck discontinuous as such is an art equivalent as taught by Henderson.

Regarding claims 61, 64 and 73, neither Peterson nor Lebeck disclose that the orifices are angled or that the pumping grooves have a width exceeding their depth. These are considered design choices. Applicant has not stated that making the orifices angled or the pumping grooves with a width exceeding their depth solve any stated problems or are for any particular purposes. See *In re Dailey*, 149 USPQ 47 (CCPA 1966). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to make the orifices angled and the pumping grooves with a width exceeding their depth as a matter of choice in design.

7. Claims 76 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peterson in view of Lebeck in view of Henderson as applied to claim 56 above, and further in view of Lindeboom.

Peterson discloses a spring. However the spring does not bias the stator and rotor apart. Lindeboom teaches a rotary face seal assembly wherein one member 30 has a holder 48 and a spring 52 that biases the first and second members apart. This arrangement provides a normally open, rather than closed, seal assembly. Keeping the assembly open would reduce wear during start up. Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made modify the holder, member, and spring of Peterson such that the spring biases the first and second members apart as taught by Lindeboom to reduce wear on the members during start-up.

Allowable Subject Matter

8. Claims 27, 53, and 77 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

9. Applicant's arguments filed 9-7-04 have been fully considered but they are not persuasive and moot in view of the new grounds for rejection.

Lebeck, DE '566, and Shimizu '943 disclose that pumping grooves provide a uniform fluid film even during coning. This is further supported by Applicants' own specification page 5, lines 5-11. Thus, it is not the feeding groove that achieves the uniform fluid film during coning as argued by Applicant. The feeding groove is used to supply the fluid to the center of the faces. Applicant's argument on page 19, paragraph 2 (of arguments) is not supported by or stated in the specification. In fact, the specification discloses that a continuous OR discontinuous groove can be used to supply fluid. Henderson evidences this, which is of ordinary skill to one in the art. Henderson clearly teaches that either a continuous or discontinuous feeding groove can be used to supply fluid to the center of mating sealing faces to direct fluid both simultaneously inward and outward to create a fluid film.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alison K. Pickard whose telephone number is 703-305-0882. The examiner can normally be reached on M-F (10-7:30), with alternate Friday's off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Swann can be reached on 703-306-4115. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alison K. Pickard
Primary Examiner
Art Unit 3676

AP